This document explains how to use the graphical interface of the ***DISIR*** QGIS plugin. It allows to interactively semantically segment georeferenced images with a neural network previously trained for this task.

To install the plugin or to train a neural network, please refer to the associated github repository: https://github.com/delair-ai/DISIR/tree/master/qgis_plugin

You may also refer to our paper for further explanations on the method: https://arxiv.org/abs/2003.14200

⚠ **It has only been tested on Ubuntu 18.4, QGIS 3.8 and python 3.7.**

An example

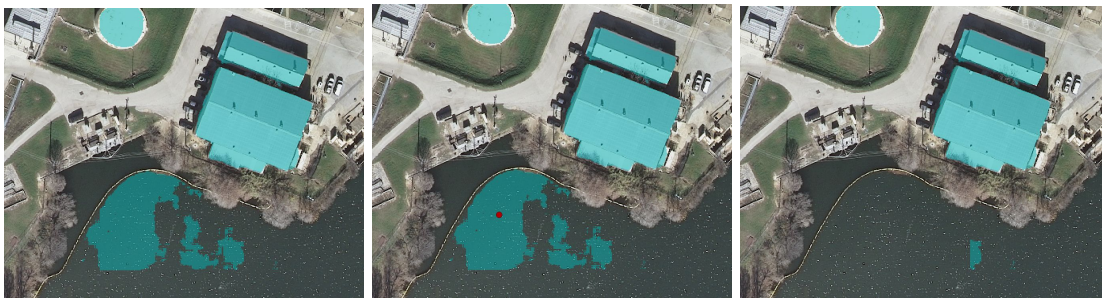
Input image

Initial prediction

Annotation "*Not building*"

Refined prediction

Zoomed version



How to use it ?

First, in a terminal:

In the root of the folder, execute:
python -m backend

```
(gaston) ➜ ~/Repos/DISIR/qgis_plugin git:(master) python -m backend
Device: cpu
Server for Qgis backend running here...
Inputs and neural network will be cached in RAM. Faster but can be troublesome with large inputs.
```

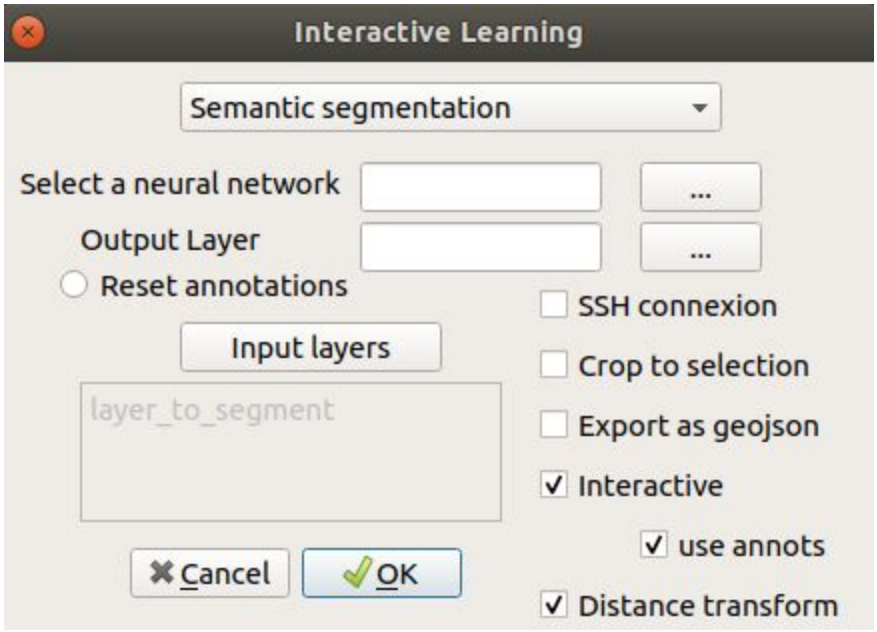
The segmentation calculations will be computed in the background in this terminal.

In QGIS:

⚠: Load in QGIS the raster (image) to segment before anything else.

After installing the plugin using the zip file, these three icons are added in the QGIS toolbar. The most important ones are the first and the last one.

: Opens the following window which allows to choose to set different parameters.



- *Select a neural network:* Select the file of the neural network used to segment. It must have been trained using the *train* part of the repository and have a *.pt* extension. You may refer to the README of the train section.
- *Output layer:* Define an output path for the output layer. Should be a geotiff format (*.tif)*.

- *Reset annotations*: To remove all of the annotations.
- *SSH connexion*: Required if the process in the terminal is running on a remote server. Establishes the connection with it. See the parameters in the *connection_setup.yml* file and read more about it in the README.
- *Crop to selection*: Allows you to choose a subsection of the raster to segment.
- *Interactive*: Implies that the network is interactive. Let it be permanently enabled unless the network is not intended for interactivity (i.e. it never takes annotations as inputs) . Will potentially be deleted later.
- *Use annots*: Disabling it implies that the segmentation will be done without using the annotations already made (but without erasing them!). This can be useful to compare a prediction made with annotations to the initial prediction.
- *Distance transform*: It is about annotations encoding and it depends on how the network was trained. Disabling it implies the annotations are binary encoded.

The input layer is the one to segment (which has been previously loaded).

Finally, click on *OK* to launch the segmentation process.

You can observe the running of the operations in the terminal :

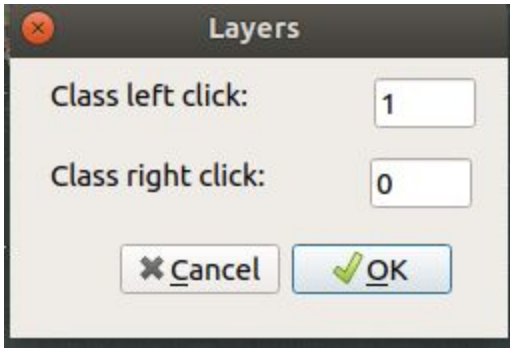
```
Running a segmentation task...
        Step 0: Load inputs.
        Step 1: Inference
        Step 2: Save outputs
Done in 46.6 seconds.
```

This button 

allows to restart the exact same calculation (i.e. with the same parameters) without having the parameters window open. This can be useful to perform the segmentation refinement after having added annotation points.

How to add annotation points

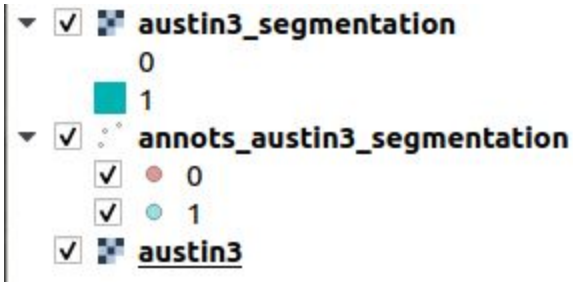
First, click on this button  . This opens the following window.



Class numbers correspond to class labels. For example, in the case of building segmentation, 0 corresponds to "*not building*" and 1 to "*building*". So, in this configuration, left click allows to annotate as building and right click as non building.

Blue: Building (class 1). Red: Not building (class 0).

There are now three layers loaded in QGIS: The image to segment (e.g. austin3), the prediction output (e.g. austin3_segmentation) and the annotation file (e.g. annots_austin3_segmentation).



The annotation file is saved in a shapefile format in the same folder than the segmentation output.

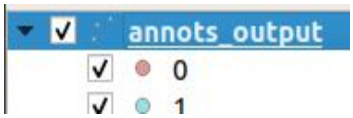
⚠ To take back the "classic" movement cursor in QGIS and exit the annotations mode, click on  .

To delete annotations

If you want to delete all annotations and make a new prediction, click on  and enable 

.

It can also happen that annotations have been misplaced. This can be corrected using the integrated QGIS tools:



1. Select the annotation vector from the list of qgis layers.
2. We activate the edition of this layer by clicking on 
3. We activate the feature selection by clicking on 
4. After selecting the annotation points to be deleted, press the `*delete*` key.
5. Once it is done, we click on  to save the edition made.